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FROM TROPICAL NORTH AMERICAN WATERS

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# NEW PORCELLANIDS AND PINNOTHERIDS FROM TROPICAL NORTH AMERICAN WATERS

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## INTRODUCTION

The littoral fauna of the west coast of Mexico, during the last few years, has produced many interesting additions to the known list of marine invertebrates. With the descriptions of these new Pacific species the foundations are being laid for a more intelligent study of the analogies which exist between faunas of the tropical Pacific and Caribbean seas. This study, revealing as it does relationships, still close, between many of our new species and those already known from Caribbean and Atlantic waters, clearly demonstrates the comparatively recent intrusion of a land barrier separating the Atlantic and Pacific oceans.

This paper, then, is an attempt to bring our knowledge of a small portion of this western fauna up to date by describing a number of newly found forms of those crab-like Anomurans, the Porcellanids. More than fifty years have passed since Lockington described a number of this group from the Gulf of California. Since that time very little attention has been paid to the Porcellanids in this area. It is hoped that, at this time, the addition of thirteen new species from those waters may make amends for this neglect.

In addition to these Porcellanids, three new species of Pinnotherids are also described: one from Panama, the other two from the Gulf of California.

I wish to express my thanks to Dr. Mary J. Rathbun and Dr. Waldo L. Schmitt of the U. S. National Museum, and to Dr. Isabella Gordon of the British Museum (Natural History), for their encouragement, valuable suggestions and assistance. I am indebted to Mr. Anker Petersen of Beverly Hills, California, for the drawings of the text figures.

## PORCELLANIDAE

*Petrolisthes schmitti*, new species

*Type*.—Female, holotype, Cat. No. 71534, and male, paratype, U. S. National Museum: from San Felipe, Baja California, Mexico, low tide; June 8, 1933; collected by Steve A. Glassell. Two paratypes, female and male, Cat. Nos. 765 and 766, S. D. S. N. H.; from same series.

*Diagnosis*.—Carapace quadrilateral. Chelipeds short; carpus short, unarmed. First antennal peduncle lobed. A small species.

*Description*.—Carapace as long as wide, sides subparallel, margined with a distinct ridge; epibranchial regions roughened with rugae, remaining regions smooth, but having a few scattered tufts of tomentum. Front depressed, a single undivided process, not trilobate; line of front sinuous over antennules, slightly tomentose. Eyes large. Upper ocular margin smooth. First antennal peduncle with a horizontally depressed, distal lobe; second peduncle lightly granulate.

Chelipeds short, stout; merus short, a small lobe at distal inner angle, not protruding as far as outer edge of carpus; carpus  $2/3$  as long as wide, unarmed, with two shallow, longitudinal sulci dividing the surface into three granulated ridges; hands short, thick, subequal, similar, a longitudinal median swelling from proximal end to gape, bordered by indistinct sulci; outer part of hand and fingers granulate, with a light film of tomentum near margins; palms of hands smooth, with tufts of sponge-like hair in the gape of the fingers; pollices blunt at tips, upturned; dactyli long, sinuous, granulate, with prehensile edges closely meshing pollices.

Ambulatory legs longer than body length, decorated with irregular tufts of tomentum, sparingly setose.

Abdomen and epimera fringed with tomentum.

*Color in alcohol*.—A red-brown mottled with white.

*Measurements*.—Female holotype: length of carapace 4.7 mm., width 4.7 mm. Male paratype: length 4.4 mm., width 4.1 mm.

*Range*.—Upper part of the Gulf of California.

*Material examined*.—San Felipe, Baja California, June 8, 1933; 4 males and 7 females; collected by the author. The types for this species were selected from this series.

*Habitat*.—Taken at low water from under rocks.

*Remarks*.—This proposed species is allied to *P. gracilis*, Stimpson, 1859, in which the shape of the front is similar, but it differs from that species in that *P. schmitti* has short heavy chelipeds, with longitudinal sulci and granulated ridges on the carpus, while in *P. gracilis* the chelipeds are long, and the carpus is long, smooth and narrow. *P. schmitti* has tufts and fringes of tomentum, while *P. gracilis* is nude.



This species, being of such small size, might be considered to be in the adolescent stage, if it were not for the fact that most of the females were gravid, and that intensive collecting failed to produce larger specimens.

This species is dedicated to Dr. Waldo L. Schmitt, of the U. S. National Museum, with feelings of warm personal regard and admiration.

***Petrolisthes sanfelipensis*, new species**

*Type*.—Male, holotype, Cat. No. 71535, and female, paratype, U. S. National Museum: from San Felipe, Baja California, Mexico, low tide; June 8, 1933; collected by Steve A. Glassell. Two paratypes, male and female, Cat. Nos. 767 and 768, S. D. S. N. H.; from same series.

*Diagnosis*.—Carapace striated, bearing spines on the front, ocular margin, and on the hepatic, branchial and protogastric regions. Nearly the entire dorsal and ventral surfaces covered with either striations or squamae.

*Description*.—Carapace nearly as long as wide, regions well marked, transversely plicated with micro-piliferous striae, interrupted by the cervical groove and cardiac margins; a row of spines completely across the carapace behind the eyes, interrupted by the median sinus and cervical groove; a group of spines on the epibranchial region and a spine on the margin posterior to the hepatic region. The front is triangular, depressed, and margined with thick-set blunt teeth, separated from the ocular margin by a sinus. The supraocular margin is armed with sharp, forward-pointing teeth, increasing in length anteriorly; a single sharp, postorbital tooth. Other teeth may be present on the forward part of the carapace in some specimens, but, for the most part, those described here are not subject to change in location. The eyes are large, the distal end of the stalk being fringed with red hair. The distal end of the first antennal peduncle bears a horizontally compressed plate, armed with teeth on its outer margin; the second peduncle is roughened on its outer surface with blunt tubercles; the third is plain.

The chelipeds are long and narrow; merus armed at its distal inner angle with a long rugose lobe surmounted with a sharp spine, its distal margins armed with spines, its surface transversely crossed with interrupted striae; the carpus is nearly twice as long as wide, armed on its inner margin with four or five major multifurcated teeth; these teeth are covered on their long proximal edges with smaller denticles, the distal margins being short and tuberculate; the carpus may be divided into three longitudinal parts; the outer part is armed with a series of 7 or 8 forward- and upward-pointing spines, which are inside the margin and are connected with transverse striae which come up from the under side of the carpus; these spines border an interrupted sulcus; the median portion of the carpus is raised and formed of transverse laminae broken up, and this is separated from the inner side by another interrupted sulcus; the remaining portion is covered with piliferous, sharp-pointed, granulated rugae; the distal end has several teeth; the manus is long and slender, and oblique plications from the inner palm come over the crest to an inner-marginal sinus; the median ridge is

formed of longitudinally oblique, granulate-edged plications which connect with the marginal sinus; from this ridge to the outer margin the surface is covered with lamellar rugae, the interspaces filled with a short tomentum; the outer border is tomentose proximally and armed with a series of sharp, short spines; the pollex is long, thin and upturned at the tip; the dactyli fit closely to the pollices, and they are armed on their upper inner crest with a row of upward- and forward-pointing, sharp spines; their tips are compressed and multiunguiculate; on the inner side the fingers are covered with a sponge-like tomentum, short cropped; the inner side of the hand and fingers is lined with oblique, granulated striations. The under side of the carpus, merus and propodus is transversely striate.

The ambulatory legs are rather long, the merus in all three being transversely striate, and the upper crests armed with three or four sharp, outward-pointed teeth; the distal posterior end of the merus of the first and second legs has spines, as has also the upper distal end of the carpus on these legs; the propodus is nearly  $1\frac{1}{2}$  times as long as the dactylus; the dactyls are curved, with a corneous tip, armed on their under sides with four corneous spines.

The abdomen is transversely striated on all segments, bordered with setae.

The first three segments of the outer maxillipeds are striated.

*Color in life.*—A faint pinkish tint, but when freshly preserved in alcohol is beautifully colored with rich reds and purple.

*Measurements.*—Male holotype: length of carapace 8.7 mm., width 9 mm. Female paratype: length 7.6 mm., width 7.9 mm.

*Range.*—Upper end of the Gulf of California.

*Material examined.*—A series of 10 males and 10 females, collected at San Felipe, Baja California, June 8, 1933, by the author; the types were selected from this series. A series of 10 males and 10 females, collected at Punta Peñasco (Rocky Point), Sonora, May 2, 1935, by the author.

*Habitat.*—Taken at mean low tide level and below, from among sponges and gorgonians.

*Remarks.*—This proposed species is allied to *P. hirtispinosus* Lockington, 1878, but differs from that species in the greater number of spines on the carapace and front, the more distinctive markings of the carapace, the less equal distribution of spines on the carpus of the chelipeds, and in the hand not being covered with a short pile of tomentum. Also, the ventral part of *P. hirtispinosus* is not striated.

#### ***Petrolisthes nigrunguiculatus*, new species**

*Type.*—Male, holotype, Cat. No. 71536, and female, paratype, U. S. National Museum: from Santa Catalina Island, Gulf of California, Mexico, low tide; December 14, 1931; collected by Steve A. Glassell. Two paratypes, male and female, Cat. Nos. 769 and 770, S. D. S. N. H.; from same series.

*Diagnosis.*—Carapace flattened, smooth in central regions, squamoso-granulate on front and anterior margins, front deflexed. Chelipeds of male dissimilar, tuberculate.

*Description.*—Carapace about equally wide as long, depressed, central regions smooth, anterior margins and front squamoso-granulate and microscopically covered with tomentum; a transverse hepatic lobe; a well-defined protogastric ridge; front deflexed, triangular, with a wide ridge-bordered median sulcus; the upper ocular margin paralleled by a groove which terminates in a notch, this notch separates the front from the preorbital lobes. First antennal peduncle with a prominent lobe distally; second peduncle serrated with granules on outer surface; third smooth; flagellum smooth.

Chelipeds of males, dissimilar; of females, similar in some, in others as in the males; merus with inferior distal end extending nearly  $1/3$  the distance to the hooked tip of the carpus; the inner distal end has a long subvertical, blunt, granulated lobe; carpus short, about twice as long as wide, covered with squamoso-granules along the median ridge, with irregular tuberculate granules on the remaining surfaces, the inner margin armed with three or more clustered, blunt-ended teeth, the distal posterior end a long, forward-curving tooth; hands covered with various sized squamous granules and tubercles, the inner margin rounded, the outer sharp and fringed with an even length of fine pinnate hair, growing out of flat, lamellar serrations to a point near the blunt tip of the pollices; also extending over the fringe is a series of short, subequally spaced, transverse ridges, ending as teeth; the major hand of the male has a median swollen ridge to the gape; the pollex is thick, stubby; the dactylus stubby, distorted, extending past the pollex and bluntly curved at the tip; these fingers gape widely and cannot be brought together, due to a large, distorted lobe on the proximal cutting edge of the dactylus; the inner surface of the dactylus has a heavy growth of pinnate hair, which is absent or present in less quantity on the minor chela; in the females with similar hands this growth may be entirely absent. The minor chela of the males is similar to both chelas in the majority of females, in which the tip of the pollex is truncate, thin and wide, the dactyl long, curving, and engaging the pollex for its entire length; the surface is as that of the major chela.

The ambulatory legs are short; merus compressed, wide, crested with minute granules distally; carpus and propodus longitudinally ridged with rows of small teeth, lightly fringed with setae; dactyli with curved corneous tips; a distinctive feature of these dactyli is their color—a deep, dark brown, almost black.

*Color in life.*—Thickly mottled with dark brown and reds. Tips of chela a light red. Tomentum and fringes a dirty white.

*Measurements.*—Male holotype: length of carapace 7.2 mm., width 7 mm. Female paratype: length 7.5 mm., width 7.3 mm.

*Range.*—Gulf of California.

*Material examined.*—Approximately 20 males and 20 females, Santa Catalina Island, Gulf of California, December 14, 1931, collected by the author. The type material was selected from this series.

*Habitat*.—Under side of rocks at low and half tide levels.

*Remarks*.—This proposed species is closely allied to *P. hirtipes* Lockington, 1878, which is found in the same region, but the latter may be distinguished from *P. nigrunguiculatus* by some of the following characters: *P. nigrunguiculatus* is smooth in the central regions of the carapace, instead of rugose; the carpus of the chelipeds is armed with several lobular spines, instead of having but one lobular group at the proximal end; the front is unbordered with setae, instead of being fringed with fine thick hair; only the outer margins of the hands are fringed, instead of the entire margins of the chelipeds and ambulatory legs. *P. hirtipes* is also the larger species of the two, a male collected at Magdalena Bay, Baja California, December 4, 1931, measured: length of carapace 10 mm., width 10 mm.

### *Petrolisthes tiburonensis*, new species

*Type*.—Female, holotype, Cat. No. 71537, and male, paratype, U. S. National Museum: from south end of Tiburón Island, Gulf of California, Mexico, low tide; December 31, 1931; collected by Steve A. Glassell. Two paratypes, female and male, Cat. Nos. 771 and 772, S. D. S. N. H.; from same series.

*Diagnosis*.—Carapace convex anteriorly, very rugose; front trinoduled. Antennal peduncles nodulous. Merus of ambulatory legs carinate. Dimorphic.

*Description of female*.—Carapace a little wider than long, convex anteriorly, with regions well defined, anteriorly covered with lobate granules, posteriorly with well defined, disconnected striae; borders rounded over, high, except for posterior margin which is bimarginal and concave. The front is trinodulous, the nodules blunt and upturned, the median the largest and more extended. Eyes large. First antennal peduncle with a large single or bilobed process extending past the joint of the second peduncle; the latter also has two or three prominent, blunt lobes posteriorly, one distal, also many small granules; the third peduncle has a single distal lobe.

The chelipeds are similar; merus with a single upward-pointed lobe at the distal anterior margin, the surface is rugose; the carpus has subparallel margins, is rugose, with a median ridge, armed with a forward-pointed, hook-like tooth at the posterior distal end; the anterior border is armed with a series of unequal, small teeth, more numerous at the proximal end; hands similar, rounded on the inner margin, compressed on the outer, which is armed with a series of sharp, forward-pointing teeth, their anterior base setose; viewed from underneath the teeth are unequally spaced and of irregular length; on the outer surface the hands are granulate, with a wide rounded median ridge to the gape of the fingers, thence continues around the cutting edge of the pollex, and terminates at the base of the upturned tip; the prehensile fingers are distorted, with a striated upper carina, a median striated or granulated ridge, channeled on each side; the palms of the hands are smooth, the inner gape with a bunch of fine, long, pinnate hair.

The ambulatory legs are short; merus stout, armed on the upper surface with irregular, blunt, conical lobes, a median ridge with sulci on each side; the carpus of the first leg is bilobed on its upper surface, a lobe at each end, a large double-ended lobe on the distal inner side; carpi of second and third legs bilobed, eroded; propodi with longitudinal ridges; dactyli with curved corneous tips, armed underneath with short, supplemental, corneous spines; legs sparsely margined with small tufts of setae, and granulate.

*Description of male.*—Differs from the female in being much larger, and having the carapace, front, antennal peduncles and chelipeds much smoother. The margins of the carpus of the chelipeds are not parallel, being widest at the distal end, unarmed on the inner margin, or at best vaguely indicated. The hands are unarmed on the outer margin with either teeth or setae, being smooth and rounded. The ambulatory legs differ from those of the female in that the merus of the first leg has a smooth crest; the other legs differ only in that they are less heavily margined with lobes.

*Color in life.*—A chocolate brown.

*Measurements.*—Female holotype: length of carapace 9.2 mm., width 10 mm.; length of carpus 7.3 mm., width 2.6 mm.; length of hand 12 mm.; width at base of finger 5.8 mm. Male paratype: length of carapace 10.5 mm., width 10.8 mm.; length of carpus 12 mm., width 3.8 mm.; length of hand 21 mm.; width at base of finger 8.1 mm.

*Range.*—It seems peculiar that this species has so far been taken in the Gulf of California only between latitudes  $28^{\circ} 30'$  N., and  $30^{\circ}$  N., although extensive collecting has been done on each side of these boundaries.

*Material examined.*—South end of Tiburón Island, Gulf of California, December 31, 1931: approximately 20 males and 20 females, collected by the author. The types have been selected from this series. Also from Angeles Bay, Baja California, January 4, 1932: 1 male and 3 females. Puerto Refugio, Angel de la Guardia Island, Gulf of California, January 6, 1932: 2 males.

*Habitat.*—Collected under rocks at low tide. Plentiful.

*Remarks.*—This proposed species is allied to *P. crenulatus* Lockington, 1878, which it somewhat resembles in the shape of the carapace and ratio of measurements (both species being wider than long). They differ in nearly every other respect, *P. tiburonensis* being brown instead of red and white, slightly setose instead of quite tomentose, etc. The chelipeds of the adult males somewhat resemble those of *P. gracilis* Stimpson, 1859, but here the resemblance ceases.

Stimpson in his description of the genus *Petrolisthes*<sup>1</sup> states: "Carapax depressed subovate, not broader than long." Strictly followed, neither *P. crenulatus* nor *P. tiburonensis* would be placed in the genus *Petrolisthes*, although they both agree in other particulars, for both of these species are subquadrate,

<sup>1</sup> Rept. on Crust. Coll. by N. Pac. Expl. Exped. 1853-56. Smithsonian Misc. Coll., Part vol. XLIX, 1907, p. 181.



instead of subovate, and are broader than long. A normal, large specimen of *P. crenulatus*, which I collected at the type locality, has the following measurements: length of carapace 13.5 mm.; width 15 mm.

Without attempting to amend the genus or create a subgenus for the reception of this and other species, I have placed it in the genus *Petrolisthes*, awaiting a much-needed, thorough revision of the Porcellanids.

I selected the female for the holotype of this species, as most of the juvenile males bear a closer resemblance to the female form than they do to the mature males.

### *Pisosoma smithi*, new species

*Type*.—Female, holotype, Cat. No. 71538, and female, paratype, U. S. National Museum: from Miramar Beach, near Guaymas, Sonora, Mexico, low tide; December 23, 1931; collected by Steve A. Glassell. Female paratype, Cat. No. 773, S. D. S. N. H.; from same series.

*Diagnosis*.—Carapace suboval, lightly marked with transverse plications. Carpus of chelipeds nearly flat on upper surface, unarmed and rugose; hands with three ridges between the margins.

*Description*.—Carapace suboval, convex toward the front, nearly as long as wide, regions defined, cervical groove fairly deep near margins, the posterior  $2/3$  crossed with light transverse plications and punctae, more prominent near the sides and posteriorly. The front sinuous and entire in dorsal view, more prominent in front of median depression. Eyes small.

Chelipeds short, stout; merus short on dorsal side, extending further ventrally, a granulated raised carina on both upper margins, the distal inner end not protruding as far as the inner margin of the carpus; carpus rather flat on top, with both inner and outer margins projecting outward from beneath; margins unarmed, but serrated with granules, a granulated median ridge, separated from the outer margin by a granulated sinus, distally crossed by granulated, transverse striations, distal end granulate, ventral side striate; hands subequal, granulate, with three longitudinal, granulated ridges, the upper short, the lower longer, but not extending onto the pollex, which is slightly upturned at the tip; dactyli long, sinuous, granulate, with a median ridge, tip hooked; the fingers gape evenly from base to tip; under side of hand punctate, granulate in gape.

Ambulatory legs granulate on upper crest; dactyli slightly curved, tip corneous, supplemental spines on lower margin.

*Color in alcohol*.—Carapace cream color. Ambulatory legs a light pink. Abdomen and sternum iridescent.

*Measurements*.—Female holotype: length of carapace 6.4 mm., width 6.8 mm. Male paratype: width 4.7 mm., length 4.7 mm.

*Range*.—Length of the Gulf of California.

*Material examined.*—Miramar Beach, near Guaymas, Sonora, December 23, 1931: 3 females, 1 male, collected by the author. The types were selected from this small series. Also one specimen was collected at each of the following localities: Espiritu Santo Island, Gulf of California, December 6, 1931; Carmen Island, Gulf of California, January 21, 1932; Seargent's Point, Sonora, January 2, 1932; Punta Peñasco (Rocky Point), Sonora, May 3, 1935.

*Habitat.*—This appears to be a shore form occupying the lower intertidal zone with *P. sinuimanus* Lockington, but is not plentiful at any locality.

*Remarks.*—This proposed species is allied to *P. sinuimanus* Lockington, 1878, but differs from that species by the shape and form of the carpus of the chelipeds, and by the carpus not being armed on its inner margin with a proximal lobe. It differs also in that the upper surface of the carpus is flattened instead of rounded as in *P. sinuimanus*.

That Lockington was sensible to a difference between this species and *P. sinuimanus* is evident, but he attributed this difference to a variation in his species. He was no doubt influenced in his judgment by a lack of material. To quote from his notes (the italics are mine): "This species varies considerably: some few specimens are without a trace of the lobe upon the meros or of the tooth upon the anterior margin of the carpus; in others they are small, in others large and prominent. One specimen combines with the want of these teeth a carapax the surface of which is plicate upon the margins. The rolling ridges of the manus and carpus, and the deeply punctate surface of both, are constant characters."

This species is named in honor of Sidney I. Smith, whose work in carcinology on the west American coast added so much to our knowledge of this fauna.

### *Pisosoma lewisi*, new species

*Type.*—Female, holotype, Cat. No. 774, San Diego Society of Natural History; male, paratype, Cat. No. 775, S. D. S. N. H.: from Tenacatita Bay, Jalisco, Mexico, low tide; December, 1932; collected by Captain Fred O. Lewis, of the yacht "Stranger."

*Diagnosis.*—Carapace subquadrate, as wide as long, punctate. Chelipeds heavy; carpus short, wide, deeply bicusulate; hands heavy, trisulcate.

*Description.*—Carapace depressed, subquadrate, convex anteriorly, punctate; lateral margins subparallel, plicate, with plications continuing but a short distance on dorsal surface; front trilobed, not strongly advanced, median lobe depressed, triangular, with a deep median sulcus continued from the gastric regions; protogastric lobes distinct; anterior to these are another pair of lobes, transversely striate; these lobes are separated from the raised, transversely striate ocular margins by deep sulci which join the anterior hepatic sulcus posterior to the eye; a transverse plicated hepatic lobe, laterally margined by an anteriorly distinct cervical groove; on each side of the cardiac region is a crescentic whorl, opening posteriorly. The eye stalks are large, the cornea is small. Antennal peduncles heavy, stout, unarmed.

Chelipeds heavy, stout, subequal, granulate, tuberculate, rigid and deeply furrowed; merus stout, with carpal articulation transversely straight, armed at anterior distal end with a high granulated lobe; carpus including teeth, nearly as wide as long, short, wide (length 3.9 mm., width 3.3 mm.), armed on anterior margin with three or four stout, granulated, blunt, conical teeth, the distal the smallest; the carpus is deeply furrowed by two wide grooves, dividing the upper surface into three wide crests; the anterior and median crests are composed of obliquely placed, close set, rounded plications, or, in other specimens, these ridges are formed of a pavement of close set granulations; these two ridges are connected at the proximal end, open distally; the third ridge, on the outer margin, is not connected with the other two and is composed of obliquely placed tubercles and granules, which continue for a short distance on the ventral side; the hands are heavy, short, distorted, thick, with three longitudinal, deep, wide, granulated furrows, the median not separating its marginal ridges proximally; these two ridges thus form a long V, they being high, rather flat on top and composed of thickly crowded granules; the outer margin on the upper surface is a tumid, obliquely plicated ridge; these close set, beaded plications are scarcely continued on the inner side of the palm; the fingers of the major hand are short, thick, blunt, not crossing at the tips; the dactyl is armed with a large proximal lobe; the fingers of the minor hand are contorted, furrowed, granulate, with tips crossing.

Ambulatory legs short, heavy; merus wide, compressed; carpus, propodus and dactylus clothed with short, sparse setae; under side of propodi and dactyli armed with a row of short, sharp spines.

*Sexual variation.*—In the female the abdomen covers the sternum, in the male it does not. The sex may be determined at a glance by noting the relative difference in the size of the plates of the telson, those of the female being much the larger.

*Color in alcohol.*—A uniform light red.

*Measurements.*—Female holotype: length of carapace 5.5 mm., width 5.5 mm. Male paratype: length 4.9 mm., width 4.8 mm.

*Range.*—West Mexican coast, from Acapulco to Tenacatita Bay.

*Material examined.*—Three males, one female, from Tequepa Bay, N. of Acapulco, Guerrero, December 18, 1932, collected by Captain Fred O. Lewis, of the yacht "Stranger." One male and two females, from Tenacatita Bay, Jalisco, December, 1932, collected by Captain Fred O. Lewis. The type specimens were selected from this latter series.

*Habitat.*—Littoral.

*Remarks.*—This proposed species is allied to *P. curacaoensis* Schmitt, in the general shape of the carapace and chelipeds. It differs from that species in the carpus being bisculate, instead of triscutate, by the hands being deeply triscutate, instead of fairly smooth, and by the hands being nude, instead of with a peculiar bunch of tomentum on the upper surface. The carapace of *P. lewisi*



greatly resembles that of the figure of *Petrolisthes quadratus* Benedict (Bull. U. S. Fish Comm., vol. 20, pt. 2, 1900 [1901], pl. 3, fig. 4).

This species is dedicated to Captain Fred O. Lewis of Newport Beach, California, from whose yacht "Stranger" the specimens were collected.

### *Pisosoma erosa*, new species

*Type*.—Female, holotype, Cat. No. 71539, and male, paratype, U. S. National Museum: from Magdalena Bay, Baja California, Mexico, 12 fathoms; December 2, 1931; collected by Steve A. Glassell. Female and male paratypes, Cat. Nos. 776 and 777, S. D. S. N. H.; from same series.

*Diagnosis*.—Carapace suboval, convex, heavily eroded on margins. Carpus of chelipeds and ambulatories heavily eroded.

*Description*.—Carapace subcircular, about as wide as long, convex fore and aft, regions outlined with sulci; branchial regions heavily eroded, lined and pitted; posterior third with prominent, outstanding, transverse carina, converging and ceasing at borders of intestinal region; antero-lateral margins forming a decided subcrenulate, granulated ridge; gastric regions lobed. Front in dorsal view subtruncate, entire, with a median sinus, in a front view, sharply upturned for the antennules. Eyes small.

Chelipeds short, heavy; ischium pitted and toothed; merus reticulated, pitted and eroded, a gnarled granulated lobe at distal inner end; carpus a third longer than wide, armed with a single, proximal, serrated tooth on inner margin, granulated serrations on outer surface, reticulated, eroded, pitted and scored, pits bordered with granules, under surface transversely striate, pitted; hands with two granulated ridges from proximal end to base of fingers; on both sides of these, toward the margins, are reticulations and granulate bordered pits and erosions; pollex with a granulate tumid ridge supporting its cutting edge; dactyli with a longitudinal median sinus, granulate; fingers close fitted; under side of hands rough.

Ambulatory legs with merus sharp crested, granulate; carpus sharply ridged and eroded, as is the propodus; dactyli rather long, slightly curved at tip and with a row of supplementary spines on under surface.

Abdomen fringed with hair.

*Color in alcohol*.—A light pink.

*Measurements*.—Female holotype: length of carapace 5 mm., width 5.2 mm. Male paratype (a small specimen): length 3.4 mm., width 3.4 mm.

*Range*.—Magdalena Bay, Baja California, and Gulf of California.

*Material examined*.—Two males and two females, taken at Magdalena Bay, December 2, 1931, 12 fathoms, by the author. The types for this species were selected from this material. Two small specimens from the north end of Tiburón Island, Gulf of California, January 1, 1932, 20 fathoms, collected by the author.

*Habitat*.—Evidently not a shore form, as it has so far been taken only in depths ranging from 5 to 20 fathoms.

*Remarks*.—This proposed species is allied to *P. sinuimanus* Lockington, 1878, but differs from that form in the extreme roughness of its surfaces and by the hands being less thick.

The difficulty of obtaining undamaged specimens is due not only to its small size, but also to the hard materials which are brought up in the dredge with it.

### *Pachycheles marcortezensis*, new species

*Type*.—Female, holotype, Cat. No. 71540, and male, paratype, U. S. National Museum: from off SE end of Angel de la Guardia Island, Gulf of California, Mexico, 20 fathoms; January 8, 1932; collected by Steve A. Glassell. Female paratype, Cat. No. 778, S. D. S. N. H.; from same series. One male paratype, in the collection of Steve A. Glassell, Beverly Hills, California.

*Diagnosis*.—Carapace convex fore and aft, having scattered, short bristles on anterior  $2/3$  to orbital area, orbital area covered with short, sparse tomentum. Carpus with three long and two shorter, falcate spines. Telson of abdomen with five plates.

*Description*.—Carapace wider than long, convex fore and aft, regions lightly outlined, scattered bristles, single and small groups on anterior  $2/3$ ; front covered with sparse, short tomentum, subtruncate in dorsal view, sinuous in front view; a sharp postocular spine separates the eye from the antennae; anterior margin with a distinct carina which comes onto the carapace a third of the distance from the posterior border. The first antennal peduncle is armed distally with a sharp, forward-pointing spine, the second is armed with two spines, one median, one distal.

The chelipeds are subsimilar though unequal; merus short, with a distinct distal, anterior, spinose lobe, carpal articulation tuberculate, lined with bristles, a sharp spine at distal ventral terminus; carpus short, with four or more rows of longitudinally placed tubercles, those on the posterior half having radiating setae; the anterior half is covered with flat, squamoso-granulated, bristle-bearing groups; the anterior margin armed with three large scythe-like, forward- and outward-pointing teeth and two smaller distal teeth; hands triangular, short, thick, covered on the outer surface with lobes and bristle-bearing tubercles, and armed on outer margin with a close-setting row of short, dull-pointed teeth; inner surface punctate, with more roughness near outer margin; fingers with a slight gape, tips curved, overlapping.

Ambulatory legs short, slightly setose; merus wide; carpus and propodus stout, with longitudinal rows of squamae, bearing bristles; dactyli short, heavy, curved, tips corneous, under side with several corneous spines; merus of second ambulatory leg has a few transverse striae on inner surface.

Abdomen with five plates on the terminal segment.

*Color in alcohol.*—Red mottled with white; bristles a straw color.

*Measurements.*—Female holotype: length of carapace 4.8 mm., width 5.2 mm. Male paratype: length 3.7 mm., width 3.7 mm.

*Range.*—Gulf of California, at one time called the Sea of Cortez.

*Material examined.*—Two females and two males, dredged off the SE end of Angel de la Guardia Island, Gulf of California, January 8, 1932, in 20 fathoms, by the author. The type specimens are from this series.

*Habitat.*—Evidently not a shore form.

*Remarks.*—This proposed species is allied to *P. rugimanus* A. M. Edwards, 1880, but differs in that it has five teeth on the carpus instead of three or four, and these are longer in the first three and more hooked at their tips; also the entire surface of the chelipeds is covered with setae instead of being simply granulated and furrowed.

#### *Pachycheles sonorensis*, new species

*Type.*—Male, holotype, Cat. No. 71541, and female, paratype, U. S. National Museum: from Miramar Bay, near Guaymas, Sonora, Mexico, low tide; December 23, 1931; collected by Steve A. Glassell. Two paratypes, male and female, Cat. Nos. 779 and 780, S. D. S. N. H.; from same series.

*Diagnosis.*—Chelipeds unequal, covered with short and long bristles. Carapace smooth in central area, punctate, with small bristles on remaining portions. Telson composed of seven plates.

*Description.*—Carapace nearly as long as wide, subquadrate; punctate and sparsely bristled to central area, which is smooth; a pair of transverse, setose ridges behind the frontal region; front depressed, margined with short bristles, convex, not tomentose. First antennal peduncle rough at distal end, the others smooth.

Chelipeds unequal; merus with a large anterior, distal lobe, upper surface rugose, sparsely bristled; carpus short, wide, tuberculate on proximal third and posterior border, the entire surface covered with squamae, bearing a group of short bristles; anterior margin tridentate in an arc; hands covered as in carpus, longest bristles on outer margin; inside of palm with tubercles and squamae except for central portion, tuberculate and with long bristles on inner gape of major hand; fingers of major hand unarmed, gaping; of minor hand, dentate, close-fitting, hooked at tips.

Ambulatory legs short, heavy, sparsely covered with bristles; dactyli long, curved at corneous tip, armed on under side with a row of supplementary spines.

Telson with seven plates, as in *P. pubescens* Holmes, 1900.

*Color in alcohol.*—Red mottled with white; bristles a straw color.

*Measurements.*—Male holotype: length of carapace 7 mm., width 7.5 mm. Female paratype, length 7.6 mm., width 8 mm.

*Range.*—Known from type locality only. Gulf of California.

*Material examined.*—A series of nearly a hundred specimens of both sexes, from Miramar Bay, Sonora, December 23, 1931, collected by the author.

*Habitat.*—Found at low tide, under moss and sponge incrustated stones.

*Remarks.*—This proposed species is allied to *P. setimanus* (Lockington), 1878, both as to size and general appearance, and in also having 7 plates in the telson; but it differs in a marked degree by not being tomentose, but setigerous instead, by having the inner side of the hand roughened and setose in the gape, instead of smooth and in having the first antennal peduncle rough at its distal end, instead of smooth.

It seems remarkable that this species was not obtained at other collecting stations in the Gulf of California, where similar collecting conditions were found.

#### ***Porcellana cancrisocialis*, new species**

*Type.*—Male, holotype, Cat. No. 71542, and female, paratype, U. S. National Museum: from Punta Peñasco (Rocky Point), Sonora, Mexico, low tide; May 2, 1935; collected by Steve A. Glassell. Two paratypes, male and female, Cat. Nos. 781 and 782, S. D. S. N. H.; from same series.

*Diagnosis.*—Carapace slightly convex, sides slightly rounded. Front sharply tridentate. Shoulder posterior to terminus of cervical groove armed with a row of fine teeth. Lower orbital margin armed with a long, sharp, forward-pointing tooth. Hands tomentose.

*Description.*—Carapace slightly convex in both directions, highest in central regions, with a polished appearance, but with front tomentose; transverse ridge behind front lined with tomentum; several short, transverse striations on branchial regions, tomentose. Front sharply tridentate, horizontal, median tooth equilaterally triangular, largest, and separated from the laterals by a deep V-shaped notch; the outer margin of the lateral teeth forms the upper ocular margin in a long sweeping curve; the lateral teeth are sharp-pointed and nearly as long as the median tooth. The eyes may be partly retracted under the shelter of the upper ocular margin, which ends in a sharp-pointed postorbital tooth. The lower ocular margin extends forward, forming a flat, sharp, horizontal tooth at its inner angle, which extends as far forward as the base of the median rostral tooth. A shoulder at the posterior terminus of the cervical groove; this shoulder extends from the margin a short distance onto the carapace and is armed on its anterior margin with a series of sharp denticles. The posterior margin of the carapace is nearly straight.

Chelipeds short, stout, subequal, the left hand usually the larger; merus short, dorsally triangular, with a vertically compressed plate-like process armed

on its forward surface with sharp thin teeth; on its distal inner end, this process terminates below the plane of the upper part of the carpus; the carpus is short and broad, about as wide as long, armed with a single, flattened, sharp-pointed tooth which occupies the proximal third of the inner margin, lightly transversely striate, with tufts of tomentum posteriorly; hands curving outward on both margins, short, thick, convex on upper surface, fingers heavier than pollices, covered on outer half with long pinnate tomentum; outer margin granulate-serrate.

Ambulatory legs stout; merus wide, crested with a few setae as are the carpus, propodus and dactylus; dactyli curved at the corneous tip and with a row of supplementary spines on the lower margin.

*Color in life*.—Ground color an ivory yellow, overcast with lavender and blood red spots. Protogastric regions lighter (white in alcohol). Chelipeds same as carapace. Ambulatory legs banded on propodus with white.

*Measurements*.—Male holotype: length of carapace 5.7 mm., width 4.8 mm. Female paratype: length 5.4 mm., width 4.8 mm.

*Range*.—Gulf of California to Magdalena Bay, Baja California.

*Material examined*.—Thirteen specimens of both sexes were collected by the author at Punta Peñasco (Rocky Point), Sonora, May 2, 1935. From this series the type specimens were selected. Three specimens were collected by the author at San Felipe, Baja California, June 20, 1936.

*Habitat*.—This species, like *P. paguriconviva*, is commensal with the large Pagurid, *Petrochirus californiensis* Bouvier, 1895, and enjoys the same association. Usually a single pair occupies a shell, but one or three may be present.

*Remarks*.—This proposed species is allied to *P. sayana* (Leach), 1820, but differs from that species in that the base of the antennae is armed with spines instead of being smooth, by the hands being more covered with hair and tomentum, and by the tip of the rostrum not being decurved. Specimens so far are scarce.

### *Porcellana paguriconviva*, new species

*Type*.—Male, holotype, Cat. No. 71543, and female, paratype, U. S. National Museum: from Punta Peñasco (Rocky Point), Sonora, Mexico, low tide; May 1, 1935; collected by Steve A. Glassell. Two paratypes, male and female, Cat. Nos. 783 and 784, S. D. S. N. H.; from same series.

*Diagnosis*.—Carapace smooth, or with tomentum on front. Front tridentate, the median tooth largest, triangular, equilateral. Chelipeds with carpus unarmed; hands dorsally flat, wide, fringed on outer margin or nude.

*Description*.—Carapace longer than wide, depressed, sides subparallel, regions ill-defined. Front horizontal, tridentate, the median tooth the largest and most prominent, triangular, equilateral (almost as in *Petrolisthes*, except not



depressed, and without a median sulcus), the lateral teeth truncate in front, forming a right angle with the upper ocular margin; the ocular margin partly covers the eyes. There is a postocular tooth; a shoulder behind the terminus of the cervical groove, unarmed; a pair of lunate pits between the gastro-cardiac regions. There may or may not be tomentum on the frontal region, usually not more than microscopic.

The chelipeds are short and heavy, depressed on upper surface; the merus is short, the distal inner end with a blunt compressed upward-pointed lobe; the upper surface of the merus is triangular, widest posteriorly, its apex the hinge of the carpus; the carpus is short, wide, flattened, lightly rugose, widest at proximal end, at which point it is as wide as long, 2 mm.; the hands are short, stout, microscopically rugose, flattened on upper surface, subequal, with tips of pollices slightly upturned; dactyli with truncate, flattened tips, crossing tips of pollices on inner margin, one hand slightly the larger, outer margin fringed with tomentose hair, or nude.

Ambulatory legs short, stocky, margined with tomentum and light setae; dactyli stout, curved at corneous tip, armed on under surface with a row of supplemental corneous spines.

*Color in life.*—Ground color, in longitudinal stripes, a bright lavender, a uniform design of bright orange overlaid on this. Chelipeds same as carapace, but not patterned; legs with a white spot on propodus. Ventral side iridescent, pinkish white, with longitudinal pattern of carapace continued on first three segments of abdomen.

*Measurements.*—Male holotype: length of carapace 5.8 mm., width 5.1 mm. Female paratype: length 5.6 mm., width 5.1 mm.

*Range.*—Gulf of California.

*Material examined.*—A series of about 25 specimens, collected by the author, at Punta Peñasco (Rocky Point), Sonora, May 1, 1935.

*Habitat.*—These little crabs are commensal with the large hermit crab, *Petrochirus californiensis* Bouvier, 1895. The usual association is: the Pagurid host, occupying the shell of *Phyllonotus nigritus* (Philippi), accompanied by a large Pollonoid worm and a pair of these little Porcellanids. At times the inner face of the shell may have a *Crepidula nivea* Gould, attached, and this in turn may be commensalized with the Pinnotherid, *Fabia granti* Glassell.

*Remarks.*—This proposed species is allied to *P. sayana* (Leach), 1820, but differs from that species in the shape of the front, which does not have its lateral teeth separated from the angles of the orbits by deep incisions. Also in that the carpus of the chelipeds in this species has its inner margin in an unbroken oblique line, while *P. sayana* has a proximal lobe on the inner margin. In this species there may be individual variations in the size and shape of the lateral teeth of the front, some protruding a little more than in the holotype and having a rounded sinus on the margin at the base of the median tooth.

*Porcellana magdalenensis*, new species

*Type*.—Female, holotype, Cat. No. 71544, U. S. National Museum: from Magdalena Bay, Baja California, Mexico, 12 fathoms; December 2, 1931; collected by Steve A. Glassell. One paratype female, Cat. No. 785, S. D. S. N. H.; from same series of 5 specimens.

*Diagnosis*.—Carapace nearly as long as wide, suboval, convex, regions defined; lateral, hepatic and upper and lower ocular margins dentate. Front trilobate, margined with denticles. Chelipeds with median longitudinal ridges, dentate. Legs long.

*Description*.—Carapace suboval, regions defined, convex, crossed with transverse rugae; protogastric lobes distinct, with anterior border prominent, tomentose. Lateral margins bordered with sharp, forward-pointing spines that are continued onto the margin of the shoulder on the carapace, which is behind the terminus of the cervical groove; hepatic regions bordered with forward-pointing spines, the proximal the largest; the front has three dentate lobes; the median triangular, with a median sulcus and slightly depressed at the tip; the lateral lobes are rounded at their apices, separated by a wide V-shaped groove from the median lobe, the outer margin extending backward, forming the upper ocular margin. The frontal lobes and both the upper and lower ocular margins are lined with small sharp teeth.

The chelipeds are long and narrow, subequal; merus fringed with small teeth on upper carpal articulation, and having a wide, compressed, inner distal lobe, fringed with teeth, and one or more teeth at ventral distal angle; carpus longer than wide, armed on inner margin with a row of small, sharp teeth, the proximal ones the largest; a median spinate ridge, the surface between this ridge and the inner margin lightly tomentose and concave, while toward the outer margin the surface between the median ridge and a row of spines parallel to the outer margin is convex and rugose; the hand is narrow, the outer margin concave, lined with spines and fringed with pinnate tomentum; a median spinate ridge from proximal end to base of dactylus is bordered by two concave surfaces; fingers long, half the length of the hand, contorted; pollex terminates in a sharp, slightly upturned point; dactylus with upper margin toothed, a short median spinate ridge between this and the prehensile edge; a fringe of pinnate tomentum veils the cutting edge.

Ambulatory legs long, fairly slender; merus crested with short setae, transversely rugose; propodus long, cylindrical, with a few setae; dactyli long, compressed, curved, with needle-like tips.

Epistome heavily plicated.

*Sexual variation and color in life*.—Unknown.

*Measurements*.—Female holotype (left cheliped missing): length of carapace 4.5 mm., width 4.6 mm.; length of hand 5 mm.; width at base of finger 1.5 mm.; length of fingers 2.5 mm.; length of carpus 2.5 mm., width 1.5 mm.

*Range*.—Known only from type locality.

*Material examined*.—Five female specimens, collected in Magdalena Bay, Baja California, in 12 fathoms, by the author. The ovigerous holotype for this proposed species is the largest of the series.

*Habitat*.—Evidently among sponges and corallines.

*Remarks*.—This species is allied to *P. serratifrons* Stimpson, 1858, but differs from that species in the shape of the front, the median lobe being triangular instead of rounded, with the lateral lobes but little less in width, instead of subacute and scarcely less prominent. The chelipeds are more heavily spined in this species than on *P. serratifrons* and, in addition, the hands are fimbriate with tomentum.

### ORTHOCHELA, new genus

Carapace longer than wide, transversely convex; front horizontal, truncate, except for a prominent, median, equilateral, rostral protuberance; the front nearly as wide as the carapace; lateral margins of the carapace subparallel, armed with short, sharp, forward-pointing spines, terminating at cervical shoulder. Eyes large, stalks thick, short; may be semi-retracted under lateral edge of ocular margin. Antennae partly excluded from orbit, nearly as long as chelipeds; flagellum naked. Chelipeds subsimilar, unequal, directed forward, as in the Galatheidæ, length about  $2\frac{1}{2}$  times the length of the carapace; merus extends past the rostrum; carpus and hand long, cylindrical; fingers short, opening vertically. Ambulatory legs short, propodi longer than merus, dactyli curved at tip, simple, not multiunguiculate. Terminal segment of abdomen with seven plates.

This genus has a remote affinity to the genus *Minyocerus* Stimpson, 1858, which is based on *Porcellana angusta* Dana, 1852, in which the chelipeds are somewhat similar. The carapace, however, differs from all the other genera in this family and is more like that of the genus *Uroptychus* Henderson, 1888, of the family Galatheidæ.

*Genotype*.—*Orthochela pumila*, new species, taken at Magdalena Bay, Baja California, Mexico, 1 fathom, on yellow gorgonian coral (sea-fans), December 2, 1931, by Steve A. Glassell.

#### *Orthochela pumila*, new species

Plate 21, figure 1

*Type*.—Male, holotype, Cat. No. 71545, and female, paratype, U. S. National Museum: from Magdalena Bay, Baja California, Mexico, 1 fathom; December 2, 1931; collected by Steve A. Glassell. One paratype male, one paratype female, Cat. Nos. 786 and 787, S. D. S. N. H.; from same series.

*Diagnosis*.—Carapace subquadrilateral, margins spinous, front unidentate,



truncate to width of carapace from base of rostrum. Chelipeds forward-pointing, long, cylindrical, fingers moving in a vertical plane.

*Description.*—Carapace subquadri-lateral, longer than wide, transversely convex, cervical groove ill-defined, surface polished, hard, microscopically punctate; lateral margins armed with a row of closely set, forward-pointing spines, terminating at the shoulder behind the cervical groove. Posterior margin straight, entire. Front truncate, wide, extending nearly the width of the carapace, where it turns backward in a curved line, thence runs tangent to its former direction, finally sweeping outward to form the postorbital tooth which covers the first antennal peduncle; the rostrum is a large, truncate-tipped, equilateral triangle whose base is the line of the front; it is armed at its truncate apex with a row of short, sharp, protruding teeth; the lateral margin of the truncate front, anterior to the eyes, is also minutely toothed. The antennae are long, naked, and may be pointed in a direction either straight forward or straight backward. The eyes are large, with stout, short stalks, and may be retracted until half of the cornea is visible beneath the upper ocular margins.

The chelipeds are subsimilar, unequal, directed forward and in large specimens may be  $2\frac{1}{2}$  times the length of the carapace; the merus extends past the tip of the rostrum; the length of the carpus is about equal to the width of the carapace, half as wide as long, subcylindrical, smooth and having a concavity at its distal inner end for the partial reception of the hand; the major hand is nearly twice the length of the carpus, cylindrical, with the fingers in a vertical plane; the fingers are short, being a trifle more than  $\frac{1}{5}$  the length of the hand; the pollex is serrated with teeth on its outer distal margin; the fingers of the minor chela are longer in proportion, and not so heavy.

The ambulatory legs are bent underneath the body in a grasping position; the merus is short, compressed, on the anterior margin ending distally with a high, sharp outward-pointing tooth; the carpus is short; propodus long and slightly curved, longer than the merus; the dactyli are long, curved at tip and armed on the under side with a row of supplementary spines, simple, not multiungulate.

The outer maxillipeds have the ischium lightly crossed with transverse striae.

The ultimate segment of the abdomen has seven plates.

*Sexual variation.*—Apparently only a difference in size, the males with the longer and heavier chelipeds.

*Color in life.*—A rich yellow; lines of red on the hepatic regions. Hands with a few red blotches on outer surface; fingers with red bases and tips.

*Measurements.*—Largest male (this specimen had lost its minor cheliped): length of carapace 3.6 mm., width 2.8 mm.; length of major cheliped 9.8 mm.; length of hand 5.1 mm.; width of merus, carpus and hand approximately the same, 1.5 mm. Female paratype: length of carapace 3.8 mm., width 3 mm.; length of major cheliped 7.7 mm.; hand 3.2 mm.; carpus 2.2 mm.; merus and

ischium 1.3 mm.; length of first ambulatory leg 3.8 mm.; merus 1 mm.; carpus 0.5 mm.; propodus 1.5 mm.; dactylus 0.8 mm.

*Range*.—Known only from the type locality.

*Material examined*.—A series of both sexes, 35 specimens, collected at Santa Margarita Island, Magdalena Bay, Baja California, December 2, 1931, in 1 fathom, by the author.

*Habitat*.—These little crabs were found clinging to yellow gorgonian coral, along with Isopods and Amphipods, all of which harmonized so exactly in color with their host that they were to be distinguished only with difficulty.

*Remarks*.—This proposed species shows a rather close relationship to the members of the Galatheidæ in the position of its chelipeds, and by having spinose lateral margins on the carapace. From their size, the location of their eyes, and the shape of the front, the specimens collected might be thought to be immature or even larval forms, if it were not that nearly all the females found were gravid.

#### PINNOTHERIDAE

##### *Fabia unguifalcula*, new species

Plate 21, figure 2

*Type*.—Female, holotype, Cat. No. 788, San Diego Society of Natural History: from Punta Peñasco (Rocky Point), Sonora, Mexico, low tide; May 3, 1935; collected by Steve A. Glassell. One female paratype, from same locality, in the collection of Steve A. Glassell, Beverly Hills, California.

*Diagnosis*.—Carapace with sides subparallel. Ischium-merus of outer maxilliped crescentoid, palp two-jointed. Dactyls of legs falcate. Hands short, wide, heavy; fingers dentate.

*Description*.—Carapace smooth, glossy, membranaceous, subtransparent, much wider than long, anteriorly arcuate, sides subparallel. Front turned abruptly downward. Eyes subovoid, cornea minute, not visible in a dorsal view. Basal joint of antennae short and wide. A narrow furrow leading backward from the buccal angle. Ischium-merus of outer maxillipeds crescentic, palp with two joints, ultimate segment wide, rounded distally.

Chelipeds stout, equal; merus short, not extending far past sides of carapace; carpus long, wide, rounded dorsally, inner proximal margin tomentose; hands short, wide, heavy, thick, smooth; lower margin sinuous; pollex slightly deflexed, with upturned, sharp-pointed tip, armed with a triangular-shaped cutting edge, with a median tooth and proximal denticles; dactylus long, falcate, armed proximally with a prominent denticulate tooth. Tips of fingers crossing.

Ambulatory legs paired, the first pair differing from the others in that the upper crest of the merus, the anterior lower margin of the carpus and propodus

are margined with tomentum. The dactyli of all legs are falcate, the fourth the least, the second the longest and sharpest.

The abdomen covers the sternum, is circular and fringed with hair.

*Sexual variation and color in life.*—Unknown.

*Measurements.*—Female holotype: length of carapace 4 mm., width 5 mm.

*Range.*—Known only from type locality.

*Material examined.*—Two ovigerous females, the larger the type, collected by the author at Punta Peñasco (Rocky Point), Sonora, May 3, 1935.

*Habitat.*—Collected in the inter-tidal zone. Association and host not determined.

*Remarks.*—This proposed species is allied to *F. granti* Glassell, 1933, but differs in that the front is nearly a continuation of the curve of the anterior margins, instead of being advanced; by the first ambulatory leg bearing tomentum, instead of being smooth and naked; and by the hands being short, stout, subquadrate and compact, instead of long and increasing in width distally. In addition, *F. granti* appears to be a much larger species.

#### ***Dissodactylus xantusi*, new species**

Plate 21, figure 4

*Type.*—Female, holotype, Cat. No. 71546, and male, paratype, U. S. National Museum: from Espíritu Santo Island, Gulf of California, Mexico, low tide; December 8, 1931; collected by Steve A. Glassell. Paratype, female, paratype, male, Cat. Nos. 789 and 790, S. D. S. N. H.; from same series.

*Diagnosis.*—Carapace convex fore and aft. Dorsal ridge short, oblique. Legs stout; dactyli of legs one to three bifurcate for almost half their length. Carpus with a transverse, setose, median ridge. Hand crossed on upper margin with three oblique, setose ridges. Terminal segment of male abdomen nearly an equilateral triangle. Palp of outer maxilliped three-jointed.

*Description.*—Carapace distinctly broader at lateral angles than posteriorly; lateral margins subequal, antero-lateral arcuate, postero-lateral straight, slightly concave posteriorly. Dorsal surface naked and polished, lightly punctate, convex fore and aft, slightly from side to side, depressions on metabranchial regions and margins of cardiac; a raised rim on antero-lateral margin sharply turns at lateral angle and continues obliquely on dorsal surface for a short distance. Margin of front slightly convex, slightly advanced beyond curve of antero-lateral margins; posterior margin sinuous.

Palp of outer maxilliped with three joints; the penultimate spatulate, truncate, with inner margin straight, with outer margin arcuate, widest distally; terminal

segment small, slightly advanced beyond line of penultimate segment and located on that segment's inner distal angle.

Merus of chelipeds extends but little beyond margin of carapace, upper distal margin setose; carpus as broad as long, crossed with an interrupted, transverse, median, setose ridge, the distal margin arcuate, setose; hands proximally swollen, upper crest straight, rounded, obliquely crossed by three distinct, setose ridges, the bristles pointing forward; the under margin has three light, oblique, setose ridges, the proximal the longest, a sparse row of long pinnate hair on inner surface to base of pollex; the outer surface is crossed with short, oblique, setose ridges, the distal ridge continuing on the base of the pollex; fingers long, close-fitting, with tips crossing.

Ambulatory legs slightly compressed, margined with fine, light hair; merus stout; carpus of first leg, only, with a longitudinal, sub-oblique ridge; the propodus has a sharp, setose crest, the bases of the bristles being just beneath this crest on the anterior side and pointing at right angles to the axis of the segment; dactyli of the first three legs bifurcate for nearly half their length; surface of legs highly polished, lightly punctate.

The abdomen of the female does not cover the sternum; the lateral margins of the segments, including the proximal half of the sixth, are subparallel; the terminal segment is broadly triangular, more than twice as wide as long. Male abdomen fused in third, fourth and fifth segments, widest at third, lateral margins converging to proximal half of penultimate segment, terminal segment an equilateral triangle. Surface of abdomen in both sexes highly polished, lightly punctate.

*Sexual variation.*—Hands of males heavier in proportion than those of the females. The females are the larger specimens.

*Color in life.*—A chocolate brown with a design of cream-colored lines and spots; the gastro-cardiac region divided by a transverse arcuate line, surmounted anteriorly by a broad V-shaped design. Legs with terminals of the joints banded with cream color; dactyli light-colored, as are the fingers of the hands; hands reticulated.

*Measurements.*—Female holotype: length of carapace 4.5 mm., width 6.1 mm. Male paratype: length 3.8 mm., width 4.9 mm.

*Range.*—Gulf of California.

*Material examined.*—Twenty specimens of both sexes were collected at Espíritu Santo Island, Gulf of California, December 8, 1931, by the author. The type specimens were selected from this series. Small series of both sexes were also collected by the author at the following stations: Las Animas Bay, Baja California, January 2, 1932; Coyote Cove, Concepción Bay, Baja California, January 18, 1932; San Felipe, Baja California, June 1, 1934; Punta Peñasco (Rocky Point), Sonora, May 2, 1935.

*Habitat*.—Commensal on the exterior ventral surface of Echinoids, such as *Mellita* and *Encope*. They are in close association with *D. nitidus* Smith; both species may at times be found on the same host.

*Remarks*.—This proposed species is allied to *D. nitidus* Smith, 1870, which it closely resembles, but from which it differs in the shape of the chelipeds, by the hands being rougher, the fingers stouter, by being naked under the pollex, instead of decorated with a tuft of thick black tomentum, and by the penultimate segment of the palp of the outer maxillipeds not having its lateral margins straight and parallel.

This species is dedicated to Louis John Xantus de Vesey, in appreciation of his character as a gentleman and of his attainments and zeal as a votary of natural history.

### *Pinnixa richardsoni*, new species

Plate 21, figure 3

*Type*.—Male, holotype, Cat. No. 791, San Diego Society of Natural History: from Balboa, Canal Zone, Panama, upper tidal zone; February 22, 1936; collected by Frank Richardson.

*Diagnosis*.—Carapace twice as wide as long, regions deeply furrowed. Hand thin, compressed; fingers acuminate. Third leg longer than body width, heavy. Dactyli of ambulatories horizontally compressed. Third, fourth and fifth segments of male abdomen fused.

*Description*.—Carapace twice as wide as long, covered with very short setae; anterior and antero-lateral margins together forming a strongly convex arch, reaching to the widest part of the cardiac region and meeting the posterior angle at an obtuse angle; posterior margin transverse at its middle for  $1/3$  of carapace width. Gastric and cardiac regions delimited, the latter wider; three longitudinal, narrow gastric furrows, the median short, reaching half way back; branchial region crossed by four obliquely transverse furrows, the hinder one deep and parallel to the posterior margin. A short dorsal hepatic furrow is directed inward and forward. The antero-lateral margin is tuberculate distally. The eyes are small, dorsally placed, filling their orbits. The front is horizontal, truncate, entire, not extending past buccal area in dorsal view. Fronto-orbital width  $1/4$  width of carapace.

Chelipeds small, longer than first leg; merus hairy, carpus and manus margined with long brown hair; carpus wide, compressed, with a high distal crest, outer surface covered with microscopic hair; hands thin, sharp-edged, compressed, not as wide as carpus, flat on outer surface, covered with minute hair, which, like those on the carpus, do not obscure the view of the surface; upper margin arched, lower margin straight; fingers narrow, longitudinal, acuminate, gaping in proximal two-thirds, movable finger crested with long hair, lower margin of



pollex nude. A median longitudinal fringe of long hair on inner side of carpus and hand. The inner proximal end of the pollex furnishes hair at the gape.

Ambulatory legs stout; the first is remarkable for the shape of its propodus and dactyl, the propodus being wide, short and heavy, its upper margin much the shorter; the dactyl is horizontally compressed, wide, short, crooked, up-turned, its margins tangent to those of the propodus, as are the margins of the dactyli of the other legs; the third leg is very heavy, stout,  $1/6$  longer than the width of the carapace and  $1/3$  longer than the second leg; the merus is equal in length to that of the carapace, and nearly half as wide as long; there is a tubercle on the distal posterior surface of the carpus and propodus. The presence of a dense growth of tomentum and setae, covering the entire surface posteriorly, makes a close observation difficult; the dactyl is stout, heavy, dull-pointed, horizontally fringed with setae; the fourth leg reaches nearly to the end of the merus of the third leg.

The abdomen is widest at the third segment, very long and narrow, overlapping the buccal cavity; third, fourth and fifth segments regularly tapering, fused, sixth long and narrow, tapering, seventh long, rounded at tip which is margined with hair, sides converging. Ischium-merus of outer maxilliped with upper distal margin arched, a transverse line of hair located centrally.

*Sexual variation and color in life.*—Unknown.

*Measurements.*—Male holotype: length of carapace 6.5 mm., width 12.8 mm.; orbital width 3.2 mm.; transverse posterior margin 4 mm.; length of second leg 9.8 mm.; of third leg 15 mm.

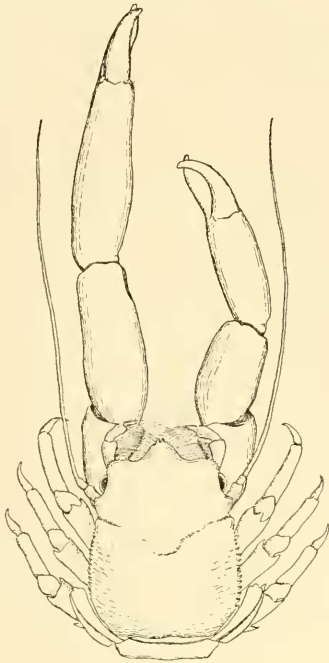
*Range.*—Known only from type locality.

*Material examined.*—The single male specimen, the holotype.

*Habitat.*—Unknown. This specimen was dug out of heavy, thick mud in the upper tidal zone, from a small channel margined with mangrove trees. No host noted.

*Remarks.*—This proposed species is very closely allied to *P. valerii* Rathbun, 1931, but differs in the outer surface of the hands and carpus being smooth, instead of covered with tomentum (as is a topotype of *P. valerii*, before me); by the outer distal margin of the outer maxilliped being arched, instead of angular; and by some of the segments of the abdomen being fused, instead of articulated. Otherwise there are a great many similarities between these two unique species, which would seem to set them apart from other species of this genus with which I am familiar.

I take pleasure in dedicating this species to Mr. Frank Richardson, ornithologist, and graduate student of the University of California, to whom I am indebted for this specimen.

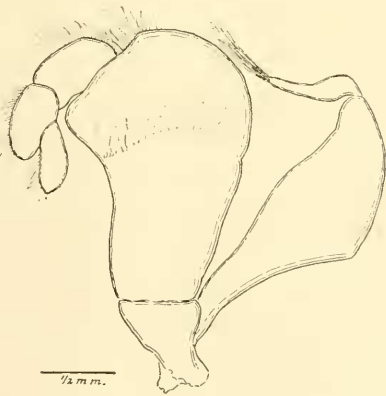


1 — 2 mm.



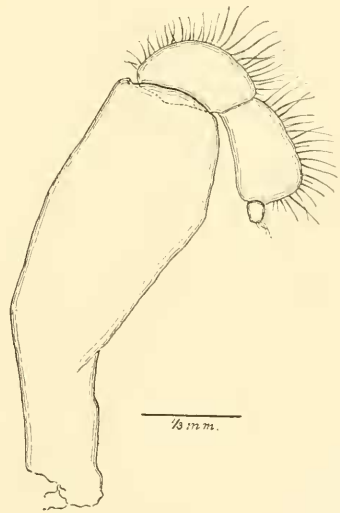
2

1/3 mm.



1/2 mm.

3



1/3 mm.

4

- Fig. 1. *Orthochela pumila*, n. gen. and n. sp. Male.  
 Fig. 2. *Fabia unguifalcula*, n. sp. Outer maxilliped.  
 Fig. 3. *Dissodactylus xantusi*, n. sp. Outer maxilliped.  
 Fig. 4. *Pinnixa richardsoni*, n. sp. Outer maxilliped.

